



INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior
National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year: 2007	Park: Shenandoah NP	Select the type of permit this report addresses: Scientific Study	
Name of principal investigator or responsible official: Damon Ely		Office Phone: 540-231-6679	
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Additional investigators or key field assistants (first name, last name, office phone, office email) Name: Herbert Maurice Valett Phone: 540-231-2065 Email: mvalett@vt.edu			
Project Title (maximum 300 characters): Increased acidity and nitrogen availability in Appalachian streams: interactive effects on nitrogen spiraling			
Park-assigned Study or Activity #: SHEN-00335	Park-assigned Permit #: SHEN-2007-SCI-0004	Permit Start Date: Mar 26, 2007	Permit Expiration Date: Feb 11, 2008
Scientific Study Starting Date: Mar 26, 2007		Estimated Scientific Study Ending Date: Feb 11, 2009	
For either a Scientific Study or a Science Education Activity, the status is: Continuing		For a Scientific Study that is completed, please check each of the following that applies: <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: Research			
Subject/Discipline: Water Resources			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

The purpose of the study is to understand how acid deposition may impair algal and microbial-driven in-stream processes of energy flow and nitrogen cycling, impairments which become apparent at the ecosystem scale with chronic stream acidification. The effects of stream acidity on community structure are most often reported with little emphasis on functional impairment. The proposed research will be the first to investigate the role of pH and associated factors on nitrogen processing, which is a valuable stream ecosystem service that may be impaired due to decades of anthropogenically-induced acidic precipitation. Long-term watershed acidification research has taken place at Shenandoah National Park and this proposal seeks to build on the existing knowledge base by increasing our understanding of whole-system effects on stream function within the park. Please see the attached proposal for a comprehensive explanation of the overall purpose and specific objectives of the study.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Anticipated studies of algal biomass accumulation and associated laboratory experiments concerning metabolic and nutrient cycling functions across the pH gradient were not completed due to unforeseen events. To understand how stream acidification affects

microbial metabolism and nitrogen (N) uptake, we performed laboratory incubations and enzyme assays on leaf biofilms collected from streams spanning a pH gradient in Shenandoah National Park. Leaf bags (6 per stream) containing 5 grams of sugar maple (*Acer saccharum*) were deployed in 7 streams ranging in pH from 5.1 to 6.9. Leaves were collected after 33 days (Nov. 17 to Dec. 20, 2007); all macroinvertebrates were removed for later identification and leaves were kept in oxygenated stream water in the dark under constant temperature until completion of all experiments. Leaf disks (1.5 cm diameter, 5 per incubation) were incubated 24 hours (n = 5 per stream) in 50 ml centrifuge tubes completely filled with reconstituted reagent-grade water containing a mixture of essential salts, phosphate-phosphorous (10 ppb), and ammonium-N (30 ppb) alongside blanks (water only, n = 5) and killed controls (leaf disks held in 100 mg/L HgCl₂ for 24 hours before incubation, n = 3 per stream). Following the incubation period, we removed 10 ml water for N analysis and measured dissolved oxygen for respiration values in all containers. Separate leaf disks were suspended in methanol and kept at -20 °C for later measurement of ergosterol content for fungal biomass determinations. In addition, the activities of carbon- and nitrogen-acquiring enzymes were measured by fluorescence following exposure of leaf slurries to fluorescent-labeled carbon- and N- containing substrates. All data are awaiting analysis at this time.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):

\$0

Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):

\$1000

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.